

Lab Activity #2

Preparation:

Pre-lab activity: perform all procedures in Experiment #32 in the lab book using Multisim (you are not expected to answer questions). Use the value of $V_{os}=1mV$ when referred back to Exp. #30, Step 4.

Class will be divided randomly in to groups of two to three students. Members of the group discuss their data sheets from Experiment #32. These should have been completed using Multisim. Make sure everyone in the group understands the experimental measurements and theoretical calculations.

Procedure:

- Select a team member to wire the circuit shown in Figure 32-1 of the lab book with the following modifications: let $R_f=120k\Omega$ and let $V_{in}=100mV_{p-p}$. The function generator in the lab can not produce a $10mV_{p-p}$ voltage waveform, so you will only have EWB data for the circuit with $R_f=100k\Omega$. While the circuit is being wired, another team member is to create a Microsoft Word table similar to the following (or use the provided electronic copy if possible):

| Circuit | V_{in} (exp) | V_{out} (exp) | A_v (exp) | A_v (theor) | A_v (EWB) | V_{ooff} (exp) | V_{ooff} (theor) | V_{ooff} (EWB) | Phase (exp) |
|-----------------------------|-------------------|--------------------|----------------|------------------|----------------|---------------------|-----------------------|---------------------|----------------|
| $R_f = 100$ k-ohm | | | | | | | | | |
| $R_f = 120$ k-ohm p-p | 100mV | | | | | | | | |
| $R_f = 10$ k-ohm p-p | 200mV | | | | | | | | |

- Before taking any measurements, enter in the theoretical and EWB values that have already been determined from the lab preparation.
- Perform Procedure steps 1, 2, and 3 in the lab book using the actual circuit constructed. Remember that $R_f=120k\Omega$ and $V_{in}=100mV_{p-p}$. Enter values measured and calculated in the $R_f=120k\Omega$ row of the table.
- Perform Procedure step 5 in the lab book using the actual circuit. In this step, you are to change R_f to $10k\Omega$ and raise V_{in} to $200mV_{p-p}$. Enter values measured and calculated in the $R_f=10k\Omega$ row of the table.
- Perform Procedure step 9 and 10 in the lab book using the actual circuit and record your findings.
- As a team respond to the following questions:

QUESTION #1: How did the experimental, theoretical, and computer simulated (EWB) results for the voltage gain, A_v , compare? Be specific and supply percent differences. Don't forget to comment on the results for $R_f=100k\Omega$ even though you do not have lab bench results to discuss in this case.

QUESTION #2: What was the phase difference between the output sine wave and the input sine wave? Was this what you expected? Explain why.

QUESTION #3: How did the experimental, theoretical, and computer simulated (EWB) results for the output offset voltage, V_{ooff} , compare? Be specific and supply

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percent differences.

QUESTION #4: What percentage of the peak input voltage was the dc input offset voltage ($V_{os}=1\text{mV}$) in each circuit? How do these percentages help explain why the offset appeared to be zero when R_f was 10 k-ohm? How could you use this percentage to specify values for V_{in} so that the offset is negligibly small?

$\% \text{ of peak} = V_{os}/|V_{in}| = 1\text{mV}/(\text{amplitude of } V_{in})$

QUESTION #5: What value for input resistance did you find by performing step 10 in the lab book on EWB? On the lab bench? What value of input resistance did you find from your calculations in step 11 in the lab book? How did the input resistance calculated based on circuit values (step 11) compare with the values calculated using EWB and lab bench measurements (step 10)?

To Be Submitted

- ◆ Those who are designated to write a lab report on this lab activity are to start work on their draft copy which must be submitted in two weeks or a grade of zero will be given.
- ◆ Each group must submit their answers to the lab questions given above within one week of the lab. Students are invited to submit electronically if possible.
- ◆ Individual Lab Assessment Forms must be ***fully completed*** or your grade will be affected. A participation grade is determined from these assessment forms and represents an average of your self-assessment and peer-assessment. If you do not ***completely*** fill out the form then you will automatically get a zero. Please submit assessment forms electronically or hard copy no later than during class one week after the lab is performed. In this way you can more effectively assess team members' participation in answering lab questions.

Late submissions are not accepted and a grade of zero is recorded.